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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/692,762	ARMSTRONG ET AL.	
	Examiner	Art Unit	
	JUNE HWU	1661	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 22 December 2008.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1,8,10-14,17-22,27,31-33,35,37-41,43-45,49-52 and 54 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1,8,10-14,17-22,27,31-33,35,37-41,43-45,49-52 and 54 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:

 1. Certified copies of the priority documents have been received.

 2. Certified copies of the priority documents have been received in Application No. _____.

 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)

2) Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5) Notice of Informal Patent Application

6) Other: _____.

DETAILED ACTION

Applicants' arguments filed on December 22, 2008 are acknowledged.

Status of the Claims

Claims 2-7, 9, 15-16, 23-26, 28-30, 34, 36, 42, 46-48, 53 and 55-58 are cancelled and claims 1, 8, 10-14, 17-22, 27, 31-33, 35, 37-41, 43-45, 49-52 and 54 will be examined on the merits.

The objections of claims 7 and 26 are withdrawn due to Applicants' amendment to the claims. Applicants have noted that the Office Action mailed December 20, 2007 at p. 3 contained a typographic error in citing claim 20 when in fact the objection is to claim 26.

The rejection of claims 1, 14, and 17-19 under 35 U.S.C. 112, first paragraph is withdrawn due to Applicants' remarks that the process of regeneration ultimately resulted in the production of plants known as "regenerable."

The rejection of claims 36-38 under 35 U.S.C. 103(a) as being unpatentable over Strickland (U.S. Patent No. 5,846,797) in view of Rangan (U.S. Patent No. 5,244,802, 1993) is withdrawn due to Applicants' amendment to the claims.

Applicant is advised that should claim 37 be found allowable, claim 44 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1 remains rejected under 35 U.S.C. 103(a) as being unpatentable over Finer (Canadian Patent 1,309,367) in view of Rangan et al (U.S. Patent No. 5,834,292, 1998).

Finer teaches a method of producing pro-embryonic cotton cell masses that are capable of regenerating into mature embryos, plantlets and whole plants (abstract and p. 3, lines 26-28). The explant used for the induction of cotton callus was hypocotyl (p. 4, last par. and p. 5, 2nd par.). The callus formed may be unorganized or may contain pro-embryonic cell masses, embryogenic callus and/or embryos (p. 7, 5th par.). The callus may be induced in the dark (p. 8, 1st par.). The development of the callus is placed in a liquid medium to promote development of pro-embryonic or proliferating embryonic cell masses (p. 8, 2nd par.) and may be cultured under dark light condition (p. 9, 2nd par.). The pro-embryonic cell masses are transferred to a liquid medium with auxin and may be cultured under dark condition (p. 10, 4th par.). The pro-embryonic cell masses are placed in a medium that induces the development of the mature embryo (p. 11). These embryos may be cultured under dark condition (p. 12, 3rd par.). The embryos are maintained in developing medium until the embryos have matured into torpedo or mature states (p. 12, 4th par.). The matured embryos are placed in a solid medium for germination and once germinated the plantlets are transferred to soil for further growth into plants (p. 14, 1st par.).

Finer does not teach the transformation of callus tissue.

Rangan 1998 teach a method of transforming cotton callus, wherein the callus is placed in a medium containing *Agrobacterium* for 1 minute to 24 hours. The callus was removed and incubated in callus growth medium. After incubation the developing callus was transferred to MS medium supplemented with NAA, cefotaxime and kanamycin. The transformed callus was selected (col. 26, lines 27-43). The results of the transformation of the cotton species to plants are shown in Example 26.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of inducing the formation of regenerable embryogenic cotton callus tissue from hypocotyl under dark lighting condition as taught by Finer and to combine that method by transforming the callus tissue as taught by Rangan 1998. One of ordinary skill in the art would have been motivated to do so given that cotton is an important agriculture crop. Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of transforming non-regenerable embryogenic cotton callus under dark lighting condition as taught by Finer and Rangan 1998 because dark lighting condition would be a choice of experimental design and is considered within the purview of the cited prior art. Moreover, culturing callus tissue under dark lighting condition would prevent the greening of the callus tissue. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants' arguments filed December 22, 2008 have been fully considered but they are not persuasive.

Applicants argue that Finer does not teach conversion of cotton callus tissue, derived hypocotyl tissue, from a non-embryogenic state to an embryogenic state (response p. 10).

This argument is not found persuasive because Finer teach that the hypocotyls are the preferred explants for embryogenic cotton callus (p. 4, last par.). When the hypocotyls are

prepared then the cotton tissue is placed on the callus induction medium to induce callus formation (pp. 5-7). The tissue starts out as non-embryogenic callus until it is placed in the induction medium wherein the formation of callus may be unorganized or may contain pro-embryonic cell masses, embryogenic callus and/or embryos (p. 7). The resulting callus is transferred to a callus subculture medium for a period of time (p. 7, last par.). The tissues are transferred to a suspension culture initiation for proliferation (p. 8 and p. 16), then to an embryo development culture (p. 11 and p. 16), and finally to a germination medium for production of plantlets (p. 12 and p. 16). Moreover, the rejection is based on a combination of references, Finer in view of Rangan 1998. Rangan 1998 teaches that embryogenic callus is formed from undifferentiated callus which is also considered as non-embryogenic callus because these cells have not undergone embryogenesis (abstract, col. 7 lines 1-27).

Applicants argue that Finer does not teach the use of hypocotyls tissue but teaches the use of somatic embryos taken from primary leaf expansion (response p. 11).

This argument is not found persuasive because Finer teaches in Example 2 on page 16 that callus was induced from seedling hypocotyls.

Applicants argue that Rangan 1998 explicitly teaches that the callus cells were cultured under 16:8 hour light/dark regime and teaches away from utilizing dark conditions as claimed (response p. 12).

This argument is not found persuasive because Applicants are attacking the references individually. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Rangan 1998 was combined with Finer to show that it would have been obvious to use the

method of transformation as taught by Rangan 1998 with the method of inducing the formation of regenerable embryogenic cotton callus as taught by Finer.

Applicants argue that Rangan 1998 Example 26 does not describe transformation of cotton cells to plants (response p. 12).

Applicants have mischaracterized Example 26. Example 26 does show the results of regenerable embryogenic callus tissues that transformed into plants. In the table of Example 26, the column under "C¹" describes the varieties such as, Acala SJ2, Acala SJ5, Acala SJ-C1, Acala CG510, Acala B1644, Acala B1654-26, Acala B1654-43, Acala B1810, Acala B2724, Acala B4984, Coker 315, Stoneville 506, Chembred B2, Chembred C4 and Siokra that were transformed in the callus stage. Under column P³ all of the varieties listed above transformed into plants. Moreover, Example 21 showed that the method of Example 20 was used to transform plants, embryos and callus (col. 26, lines 45-51). Thus, Example 26 does show the transformation of cotton callus to transformed plants.

Applicants argue that there was no reasonable basis for any alleged "expectation of success" provided in the rejection (response p. 12).

One of ordinary skill in the art would have a reasonable expectation of success in the combination of teachings of Finer in view of Rangan because Finer taught that cotton callus derived from hypocotyls may be grown under dark lighting conditions to produce plants. Rangan taught culturing undifferentiated callus derived from hypocotyls could be transformed to produce transformed plants. Thus, one of ordinary skill in the art would have success from the teachings of Finer in view of Rangan 1998 because Finer's method produced regenerated cotton plants and Rangan 1998 transformation method produced transformed cotton plants.

Applicants argue that Finer does not discuss the production of embryogenic callus from hypocotyls and that the use of light is preferred when working with pro-embryogenic cell

masses. Applicants further argue that Rangan 1998 teaches using alternating light/dark regime (response p. 13).

This argument is not found persuasive because Finer teaches that callus may be induced in the dark, but preferably induced in light (p. 8, lines 1-2). This is interpreted as that callus may be grown under complete darkness or may be grown under light. With regard to Rangan 1998 teaching alternating light/dark regime, as stated above the rejection is based on the combination of references, wherein Rangan taught a method of callus transformation and Finer taught a method of regenerating cotton callus derived from hypocotyls under dark lighting condition. Thus, it would have been obvious to try transforming the cotton callus tissue under dark lighting conditions.

Claims 8 and 10-12 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Firoozabady et al (*In Vitro Cell. Dev. Biol.* 299:166-178, 1993) in view of Davis et al (*In Vitro* vol. 9, no. 6, 1974, pp. 395-398).

Firoozabady 1993 teach that non-embryogenic cotton callus derived from cotyledon and hypocotyls tissues (p. 166, right col. last paragraph) were cultured in media under complete darkness and different light intensity (9 to 90 $\mu\text{E m}^{-2} \text{ s}^{-1}$)(p. 169, right col. last paragraph). For embryogenic callus formation and proliferation, Firoozabady et al noted that high temperature and low light were preferred for some cotton cultivars (p. 169 bridging to p. 170). After somatic embryos were formed high lighting conditions favored the germination and development of plantlets (p. 170, left col.) The embryogenic cultures were stable and somatic embryos were produced, which eventually regenerated into plants (p. 171, right col. 1st full paragraph).

Firoozabady 1993 do not teach culturing regenerable non-embryogenic cotton callus tissue, wherein the embryo inducing medium contains ascorbic acid.

Davis et al teach a method of culturing cotton (*Gossypium hirsutum*) callus derived from leaf explant (p. 395, left col., 2nd paragraph) in medium containing 5 mg/l of ascorbic acid (p. 395, right col., lines 9-10), which is between about 1 mg/L and 1000 mg mg/L. The cotton callus formed within 36 days when 5 mg of ascorbic acid was added to the LS medium (p. 396, right col. 1st full paragraph).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of inducing embryogenic calli from non-embryogenic cotton callus tissue as taught by Firoozabady 1993 and to combine that method by supplementing the culture medium with ascorbic acid as taught by Davis. One of ordinary skill in the art would have been motivated to do so given that the addition of ascorbic acid enhanced the growth of the callus as taught by Davis (p. 397, right col., 1st full par.). Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of Firoozabady et al 1993 and Davis because Davis had taught that ascorbic acid enhanced the growth of cotton callus tissue and without ascorbic acid the callus tissue would become dark pigmented (p. 396, right col., 1st full par.) and thus the addition of ascorbic acid would be a choice of experimental design and is considered within the purview of the cited prior art. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicant's arguments filed December 22, 2008 have been fully considered but they are not persuasive.

Applicants argue that the teachings of Firoozabady 1993 with Davis represent hindsight reasoning (response p. 14).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so

long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicants argue that Davis teaches adding ascorbic acid to enhance the growth of cotton callus tissue by reducing the formation of pigments in the callus tissue to non-embryogenic cultures and contradicts with the other art that teaches embryogenic cultures (response p. 14).

This argument is not found persuasive because the rejection is based on a combination of references, wherein Firoozabady 1993 taught a method of regeneration of cotton callus tissue in embryo inducing medium and Davis taught that callus tissues benefited in the addition of ascorbic acid. Thus, it would have been obvious to one of ordinary skill in the art to use ascorbic acid to the cotton callus culture medium because ascorbic acid improved the growth of cotton callus as taught by Davis.

Applicants argue that Rangan 1998 teaches away from the Office Action assertion that the reduction of pigmentation would be of benefit, at least for development of embryogenic cultures (response p. 14).

This argument is not found persuasive because the dark pigmentation observed in Davis experiment did not grow well in the absence of ascorbic acid. Moreover, Davis taught that the addition of ascorbic acid resulted in good growth of cotton callus as seen in Fig 1B. Thus it would have been obvious to one of ordinary skill to add ascorbic acid to an embryo inducing medium as taught by Firoozabady 1993. With regard to Rangan 1998, it is noted that the Rangan 1998 reference was not cited in the rejection of claims 8 and 10-12.

Claim 13 remains rejected under 35 U.S.C. 103(a) as being unpatentable over Firoozabady 1993 in view of Davis et al as applied to claims 8 and 10-12 above, and further in view of Rangan 1998.

The teachings of Firoozabady 1993 in view of Davis et al are discussed above.

Firoozabady 1993 in view of Davis et al do not teach that the regenerable non-embryogenic cotton callus tissue is transformed.

The teachings of Rangan 1998 are discussed above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of inducing embryogenic calli from regenerable non-embryogenic cotton callus tissue comprising culturing cotton callus tissue in an embryo inducing medium containing antioxidant (ascorbic acid) to promote embryogenesis as taught by Firoozabady 1993 in view of Davis and to combine that method with the transformation of regenerable non-embryogenic cotton callus tissue as taught by Rangan 1998. One of ordinary skill in the art would have been motivated to do so given that genetic transformation would provide new cotton crops that would be resistant to pest, diseases and other environmental conditions.

Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of methods taught by Firoozabady 1993 in view of Davis and further in view of Rangan 1998 because Rangan 1998 had taught that cotton callus tissues were transformed (see Example 26) and thus would be a choice of experimental design and is considered within the purview of the cited prior art. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants argue that Rangan teaches away from reducing pigmentation of callus cultures when embryogenic callus is to be produced because reduced pigmentation could

interfere with the ability to distinguish embryogenic and non-embryogenic callus tissues (response p. 15).

This argument is not found persuasive because Rangan was combined with Firoozabady 1993 in view of Davis to show that it would have been obvious to use the method of transformation of cotton callus tissue with the method of plant regeneration of cotton as taught by Firoozabady 1993 in view of Davis. With regard to the interference of distinguishing embryogenic and non-embryogenic callus tissue is irrelevant because Rangan 1998 did not state that there were any difficulty distinguishing between embryogenic and non-embryogenic callus tissue.

Claims 14, 17 and 18 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Firoozabady 1993 in view of Chi et al (Plant Cell Reports (1990) 9: 195-198).

The teachings of Firoozabady 1993 are discussed above.

Firoozabady 1993 does not teach supplementing the callus tissue medium with AVG to induce the formation of embryogenic cotton callus.

Chi et al teach that AVG enhanced shoot regeneration from cotyledons of *Brassica*, a dicot. Cotyledons and hypocotyls of *Brassica* were excised and cultured on medium containing 20 μ M AVG (p. 195 right col. last paragraph to p. 196, left col., line 4 and Table 1), which is between about 1 mM and 100 mM. Chi et al noted that there had been evidence that ethylene effected growth and differentiation of plant cells and tissues and that ethylene inhibition enhanced plant regeneration of *Nicotiana* and *Triticum*, increased protoplast growth of *Solanum*, promoted embryo production in anther cultures of *Brassica* and somatic embryogenesis of *Daucus* (p. 195, left col.).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of inducing regenerable non-embryogenic cotton callus tissue as taught by Firoozabady 1993 and to modify that method by the addition of AVG as taught by Chi. One of ordinary skill in the art would have been motivated to combine Firoozabady 1993 and Chi because Chi taught that dicot plants were able to regenerate with the addition of AVG (p. 198, left col., 1st full paragraph). Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of Firoozabady 1993 in view of Chi because supplementing the cotton callus tissue medium with AVG would be a choice of experimental design and is considered within the purview of the cited prior art. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants argue that (1) *Brassica* species are not closely related to cotton species; (2) *Brassica* typically regenerate via organogenesis rather than embryogenesis; and (3) AVG treatment discussed in Chi showed variable results when applied to *Brassicaceae* (response p. 15).

This argument is not found persuasive because one cannot show non-obviousness by attacking the references individually where the rejection is based on a combination of references. Chi was combined with Firoozabady 1993 to show that it would have been obvious to try to use AVG because AVG is known to aid in the growth and differentiation of plant cells (Chi p. 195, left col. 3 rd par.).

With regard to (1) *Brassica* as not being closely related to cotton species is not found persuasive because it would have been obvious to one of ordinary skill in the art to try to use AVG in cotton species because they are in the same dicot family. As stated above, AVG is known to aid in growth and differentiation of plant cells.

With regard to (2) *Brassica* being typically regenerative via organogenesis rather than embryogenesis is not found persuasive because Chi taught that other plant cells could benefit from the use of AVG, such as enhancing plant regeneration from callus of *Nicotiana* and *Triticum*, increased protoplast of *Solanum*, and promoted embryo production in somatic embryogenesis of *Daucus*. Thus, if AVG could improve the growth or production of plant cells then it would have been obvious to try AVG on cotton callus.

With regard to (3) AVG treatment in Chi show variable results when applied to the *Brassica* family is not found persuasive because it would have been obvious to one of ordinary skill in the art to try to use AVG because AVG enhanced regeneration of other recalcitrant *Brassica* species. It would also be obvious for one of ordinary skill in the art to try to combine the teaching of plant regeneration of cotton as taught by Firoozabady 1993 with the teaching of the use of AVG as taught by Chi on other plant species to regenerating plants because there are many variables that may be used in tissue culturing plants. Moreover, Chi taught that AVG affected the growth and differentiation of plant cells as noted above.

Applicants argue that a skilled worker would not have any expectation of success in applying Chi in view of Firoozabady (response p. 15).

This argument is not found persuasive because Chi taught that AVG promoted somatic embryogenesis in *Daucus carota*. Since there was success in *Daucus*, then there would be an expectation of success in combining the use of AVG with the method of embryogenesis as taught by Firoozabady to produce regenerable embryogenic cotton callus tissue.

Applicants argue that the Office Action provides no rationale as to how application Chi would be applied to Firoozabady 1993 because the Office Action does not define the "effect" of AVG (response p. 15).

This argument is not found persuasive because as stated above AVG is known to effect the growth and differentiation of plant cells as taught by Chi. Thus, it would have been obvious to one of ordinary skill in the art to try to use AVG with cotton callus tissue because AVG is known to effect the growth and differentiation of plant cells.

Applicants reiterate that shoot regeneration is an example of organogenesis and not embryogenesis as required by the present claims. Applicants further argue that the organogenic method as taught by Chi would render the Firoozabady reference unsatisfactory for its intended purpose and would change the principle of operation of the teachings of Firoozabady by substituting organogenesis for embryogenic callus and cites (MPEP 2143.01; 2145 (X) (D)) (response p. 16).

This argument is not found persuasive because as cited in the previous Office Action dated 6/20/08 at page 11 and above, the rejection is based on a combination of references Firoozabady 1993 in view of Chi. Chi was combined with Firoozabady 1993 to show that AVG may be applied to other plant species and different explants as taught by Chi (p. 195, left col.). It would have been obvious to one of ordinary skill in the art to try to use AVG in regenerating cotton callus tissue because AVG is known to have beneficial effect on tissue culturing plants as taught by Chi.

With regard to MPEP 2143.01 (III), it states, "...if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve a similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skills". In this case Chi who taught the use of AVG in seedling explants of *Brassica* resulted in high frequency of plant regeneration, then it would have been obvious to one of ordinary skill in the art to try to use AVG in regenerating cotton callus tissue because the technique is obvious and the application is not beyond his or her skill level.

With regard to the reference teaching away from the invention (MPEP 2145 (X) (D)), MPEP 2145 states that “prior art must be considered in its entirety, including disclosures that teach away from the claims”. MPEP 2141.02 (VI) states that “the prior art’s mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed...” *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004). In this case, Chi taught the use of AVG in shoot and root regeneration and pointed out the advantages of ethylene inhibitor on different plant species and on different explants. The prior art does not teach away from the instant claims. In addition, Chi states, “Evidence from this and other studies (Chi and Pua, 1989; Pua, 1990) implies that the recalcitrance of cells and tissues of both *Brassica* species in culture may be associated with ethylene.”

Applicants argue that the previous responses do not discuss effect of AVG in dicots versus monocots and that both *Brassicaceae* and *Gossypium* spp. are dicots (response p. 16).

This argument is not found persuasive because the Office Action mailed 6/20/08 at page 12 was a statement from Chi that AVG had an effect on growth and differentiation of plant cells in monocots, such as *Zea* and dicots, such as *Nicotiana*. If AVG has an effect on monocots and dicots then it would have been obvious to one of ordinary skill in the art to use AVG on cotton plants. The instant specification states at p. 18, "The resulting effects of ethylene inhibition on plant growth and development are varied, depending on the plant system and the inhibitor(s) tested." Thus, it would have been obvious to one of ordinary skill in the art to try to use AVG on cotton tissue.

Claim 19 remains rejected under 35 U.S.C. 103(a) as being unpatentable over Firoozabady 1993 in view of Chi et al as applied to claims 14, 17 and 18 above, and further in view of Rangan 1998.

The teachings of Firoozabady 1993 in view of Chi et al are discussed above.

Firoozabady 1993 in view of Chi et al do not teach that the regenerable non-embryogenic cotton tissue is transformed.

The teachings of Rangan 1998 are discussed above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of inducing embryogenic calli from regenerable non-embryogenic cotton callus tissue comprising culturing cotton callus tissue in an embryo inducing medium containing antioxidant (ascorbic acid) to promote embryogenesis as taught by Firoozabady 1993 in view of Chi and to combine that method with the transformation of regenerable non-embryogenic cotton callus tissue as taught by Rangan 1998. One of ordinary skill in the art would have been motivated to do so given that genetic transformation would provide new cotton crops that would be resistant to pest, diseases and other environmental conditions.

Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of methods taught by Firoozabady 1993 in view of Chi and further in view of Rangan 1998 because Rangan 1998 had taught that cotton callus tissues were transformed (see Example 26) and thus would be a choice of experimental design and is considered within the purview of the cited prior art. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants argue that the addition of Rangan 1998 does not cause the Chi reference to be any less irrelevant to embryogenic cotton cell culture (response p. 17).

This argument is not found persuasive because Rangan was combined with Firoozabady 1993 in view of Chi because Rangan 1998 taught a method of cotton callus transformation.

Claims 20-22 and 27 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Finer in view of Rangan 1998, further in view of Davis and further in view of Chi.

The claims are drawn to a method of culturing transformed regenerable non-embryogenic cotton callus tissue, wherein the callus tissue is derived from hypocotyl in a medium containing AVG and ascorbic acid under dark lighting conditions to induce regenerable non-embryogenic calli.

The teachings of Finer in view of Rangan 1998 are discussed above.

Finer in view of Rangan 1998 do not teach that the medium is supplemented with AVG and ascorbic acid.

The teachings of Davis are discussed above.

The teachings of Chi are discussed above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of culturing transformed regenerable non-embryogenic cotton callus tissue under dark lighting condition as taught by Finer in view of Rangan 1998 and to combine that method by adding ascorbic acid as taught by Davis and also adding AVG as taught by Chi. One of ordinary skill in the art would have been motivated to do so given that the addition of ascorbic acid reduced the formation of black pigments in callus and that AVG has shown that without ethylene inhibitor the explants were poorly regenerative (p. 197, right col. 3rd full par.). Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of methods as taught by Finer in view of Rangan 1998 and further in view of

Davis and Chi because the addition of ascorbic acid and ethylene inhibitor would be a choice of experimental design and is considered within the purview of the cited prior art. Moreover, it is noted by Chi that the addition of AVG aided plant regeneration and ascorbic acid prevented browning of the callus tissue as taught by Davis. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants request clarification that the claims 20-22, 26 (now cancelled) and 27 as reciting that the callus tissue is derived from hypocotyls tissue (response p. 17).

Claim 27 which is dependent of claim 20 cites that the cotton callus is derived from callus, hypocotyl, cotyledon, root, petiole, anther, or leaf.

Applicants argue that Finer in view of Rangan teaches away from the use of dark conditions to culture cotton callus (response p. 17).

This argument is not found persuasive because as stated above the rejection is based on a combination of references, wherein Finer taught a method of regenerating cotton callus under dark or light condition and Rangan 1998 taught the transformation of cotton callus. Thus, it would have been obvious to one of ordinary skill in the art to try to use the dark lighting condition as taught by Finer with the method of transforming regenerable cotton callus tissue as taught by Rangan 1998.

Applicants argue that Rangan 1998 teaches away from the Action's asserted reason for use of the teaching of Davis, to reduce formation of black pigment in cultured cells (response p. 17).

This argument is not found persuasive because Rangan 1998 taught that the anthocyanin pigmentation eventually developed into yellowish-white embryogenic callus while Davis noted that the absence of ascorbic acid cause the callus to become dark pigmented and

grew poorly. If Rangan 1998 had supplemented the ascorbic acid in the culture medium, then Rangan 1998 tissues may not have produced any anthocyanin pigmentation.

Applicants argue that Chi is not operable with respect to the use of ethylene inhibitor for the induction of embryogenic callus tissue because it discusses organogenesis (response pp. 17-18).

This argument is not found persuasive because as stated above Chi was combined with Finer, Rangan 1998 and Davis to show that it would have been obvious to use AVG (ethylene inhibitor) in the culture medium. AVG is known to aid in growth and differentiation of plant cells as taught by Chi.

Applicants argue that Chi teaches away from an embryogenic approach to plant regeneration and cite a table on p. 16 of the previous response filed on 4/21/08 (response p. 18).

This argument is not found persuasive because as stated above Chi was combined with Finer, Rangan and Davis to show that it would have been obvious to use AVG in plant regeneration. The table on p. 16 of the previous response shows the use of AgNO_3 in plant regeneration and not AVG.

Applicants argue that there is no expectation of success in applying the teachings of Chi with Finer, Rangan or Davis (response p. 18).

This argument is not found persuasive because all of the claimed elements were known in the art and one skilled in the art could have combined the elements as claimed by known methods with no change in their functions and the combination would have yielded predictable results. The method of culturing transformed regenerable non-embryogenic cotton callus under dark lighting condition is known in the art and the addition of antioxidant and ethylene inhibitors in the plant tissue culture are also known in the art.

Claims 31-33 and 35 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Finer in view of Rangan 1998, in view of Davis, and further in view of Chi as applied to claims 20-22 and 27 above, and further in view of Firoozabady et al (Plant Molecular Biology 10: 105-116, 1987).

The teachings of Finer in view of Rangan 1998, in view of Davis, and further in view of Chi are discussed above.

Finer in view of Rangan 1998, in view of Davis, and further in view of Chi do not teach that the support matrix is filter paper.

Firoozabady 1987 teach that cotyledon tissues may be placed on filter paper for transformation of callus tissue (p. 107, right col. 2nd paragraph).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the teachings of culturing transgenic cotton embryos as taught by Finer in view of Rangan 1998, in view of Davis, and further in view of Chi et al and to modify that method by using filter paper as the support matrix as taught by Firoozabady et al 1987. One of ordinary skill in the art would have been motivated to do so given that filter paper is another form of support matrix used in tissue culture. Moreover, one of ordinary skill in the art at the time the invention was made would use the method of culturing transgenic cotton callus tissue grown under dark lighting conditions and the addition of ascorbic acid and AVG as taught by Finer, in view of Rangan 1998, in view of Davis, and further in view of Chi and to combine that method by using filter paper as the support matrix because Firoozabady 1987 states that the use of filter paper in transformation reduces bacterial over growth on plant tissue (p. 107, right col. 2nd paragraph). Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants argue that the combination of references Finer, Rangan, Davis and Chi with the addition of Firoozabady 1987 represents hindsight reasoning (response p. 18).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicants argue that Rangan teaches away from culturing in dark and from the use of antioxidant to avoid production of dark pigment as stated in the previous Office Action. Applicants further argue that the combination of Finer, Rangan, and Davis would yield no expectation of success for a skilled worker (response pp. 18-19).

This argument is not found persuasive because as discussed above the claimed elements of the inventions were known in the art and would have produced predictable results.

Applicants argue that the use of filter paper in Firoozabady 1987 during the steps of co-cultivation is distinct from the use of support medium during embryo maturation and that it would not lead an expectation of success (response p. 19).

This argument is not found persuasive because Firoozabady 1987 taught that filter paper may be used for callus initiation and transformation. Thus, it would have been obvious to try to use filter paper on the embryo maturation medium since it could be used in the initiation and transformation step.

Claims 39-41 and 43-44 remain rejected and claims 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Finer in view of Davis et al, further in view of Chi et al, further in view of Firoozabady 1987, and further in view of Rangan 1993 (U.S. Patent No. 5,244,802, 1993). The rejection is modified from the rejection set forth in the Office action mailed June 20, 2008, due to Applicants' amendment of the claims.

The claims are drawn to a method of culturing regenerable non-embryogenic cotton callus tissue in medium containing antioxidant (ascorbic acid) and ethylene inhibitor (AVG) under dark lighting conditions of 0 μ Einstens $m^{-2} sec^{-1}$ and culturing the embryogenic cotton tissue in medium with a support matrix (filter paper) and amino acid hydrolysate supplement.

The teachings of Finer are discussed above.

Finer does not teach that the cotton callus tissue medium contains antioxidant, ethylene inhibitor, amino acid hydrolysate and support matrix.

The teachings of Davis are discussed above, with regard to supplementing the culture medium with an antioxidant (ascorbic acid).

The teachings of Chi are discussed above, with regard to supplementing the culture medium with ethylene inhibitor (AVG).

The teachings of Firoozabady 1987 are discussed above, with regard to culture medium containing support matrix (filter paper).

Rangan 1993 teaches a method of cotton regeneration wherein the cotton cotyledons were cut into segments (col. 12, lines 5-6) and cultured in media until callus formed then the callus was transferred to suspension medium for further regeneration (col. 13, lines 5-7). After three to four subcultures on Beasley & Ting medium containing 500 mg/l casein hydrolysate (amino acid hydrolysate), the embryogenic callus produced embryos (col. 13, lines 66-68).

These embryos eventually developed into plants (col. 14, lines 1-3). The seedling explants can also be transformed (col. 10, line 36 and examples 9-14).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of culturing regenerable non-embryogenic cotton callus tissue under dark lighting conditions as taught by Finer and to combine that method by culturing the callus tissue with ascorbic acid as taught by Davis, AVG as taught by Chi, casein hydrolysate as taught by Rangan 1993 and filter paper as taught by Firoozabady 1987 because these methods would improve the development of the callus tissue. One of ordinary skill in the art would have been motivated to do so given that ascorbic acid would reduce the amount of browning of the callus tissue as taught by Davis; AVG would aid in the growth and differentiation of cells as taught by Chi; casein hydrolysate would aid in the growth of tissue; supporting the callus on filter paper as taught by Firoozabady 1987; and supplementing the cotton tissue medium with casein hydrolysate as taught by Rangan 1993.

Although none of the cited references specifically teach that an antioxidant, an ethylene inhibitor, a filter paper and a sealing material are combined to the callus medium under dark lighting condition, one of ordinary skill in the art would have been motivated to use antioxidant, ethylene inhibitor, filter paper because antioxidant improved the growth of callus tissue, ethylene inhibitor improved the growth and differentiation of callus tissue, and filter paper would aid in transporting the tissue or preventing contamination all under dark lighting condition for the culturing of callus tissue.

With regard to the concentration of amino acid, it would have been obvious to adjust the concentration to fit the needs of the explant. It is noted that Davis used about 0.2 g (200mg) of casein hydrolysate which is between about 50 mg/L and about 150 mg/L. Moreover, all of these

supplements to the culture medium would improve the culturing of embryogenic cotton tissue and the use of the filter paper would ease in transporting the tissue.

Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of Finer in view of Davis, further in view of Chi, further in view of Firoozabady 1987, and further in view of Rangan 1993 because these methods would be a choice of experimental design and is considered within the purview of the cited prior art to produce regenerable callus tissue. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants argue that the combination of references would provide no expectation of success to a skilled artisan because it would be entirely unclear, without hindsight, which teachings from which references should be utilized (response p. 21).

This argument is not found persuasive because Finer taught a method of regenerating cotton callus in dark or light and noted that either way would work. Davis taught that ascorbic acid was beneficial in the growth of callus tissue. Chi taught there was increasing evidence that ethylene inhibition enhanced plant regeneration of callus in tobacco and wheat. Firoozabady 1987 taught a method of using filter paper on callus initiation medium or transformation of cotton. Rangan 1993 taught a method of regenerating cotton tissue with amino acid hydrolysate. Since, Finer, Davis, Firoozabady 1987 and Rangan all taught a method of cotton regeneration then it would have been obvious to combine those methods with Chi who taught the beneficial effect of ethylene inhibitor to aid in plant regeneration of plants. If all of these teachings growing in the dark, presence of antioxidant, ethylene inhibitor, support matrix and amino acid hydrolysate support the regeneration of plants then it would have been obvious to combine these teaching to regenerate cotton callus tissue.

Applicants argue that there was no support for the assertion on page 18 of Office Action that the use of filter paper “would ease in transporting the tissue” (response p. 22).

This argument is not found persuasive because this is obvious to one of ordinary skill in the art that filter paper would make it easier for a person to move the tissue to one place to another. Moreover, MPEP 2144 states, “The rationale to modify or combine the prior art does not have to be expressly stated in the prior art; the rationale may be expressly or impliedly contained in the prior art or it may be reasoned from knowledge generally available to one of ordinary skill in the art, established scientific principles or legal precedent established by prior case law.

Claims 45 and 49 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Finer in view of Rangan 1998 as applied to claim 1 above, and further in view of Gould et al (Plant Cell Reports (1991) 10: 12-16).

The teachings of Finer in view of Rangan 1998 are discussed above.

Finer in view of Rangan 1998 do not teach wrapping with laboratory film.

Gould et al teach that *Gossypium* cultivar Coker 310 can be regenerated by shoot apex for plant transformation. Gould et al taught that the shoot apex culture was supplemented with citric acid or activated charcoal (p. 13, left col. last paragraph, p. 14 col. 4th paragraph and Table 2). Furthermore, the culture plates were sealed with PARAFILM (p. 13, left col. last paragraph), a laboratory film.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of culturing regenerable transgenic embryogenic cotton tissue under dark lighting conditions as taught by Finer in view of Rangan 1998 and to combine that method with wrapping the culture with laboratory film. One of ordinary skill in the art would have been

motivated to do so given that sealing the culture would prevent evaporation and contamination. Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of Finer in view of Rangan 1998 and further in view of Gould because applying laboratory film would be a choice of experimental design and is considered within the purview of the cited prior art. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants argue that there is no basis in the Office Action that the use of laboratory film would prevent evaporation and contamination (response p. 22).

This argument is not found persuasive because it would have been obvious to one of ordinary skill in the art to try to use laboratory film whether it is to prevent evaporation and/or contamination.

Applicants argue that a step of desiccation may be helpful for the recovery of cotton plantlets from somatic embryos and cites the abstract of Sakhanokho et al (Appendix 2 filed on April 5, 2007) and that avoiding evaporation may yield unexpected results (response pp. 22-23).

This argument is not found persuasive because Sakhanokho et al do not mention the use of laboratory film in their experiment of desiccation.

Applicants argue that Gould relates to an organogenic approach for cotton plant or cell culture and that multiple conditions utilized by Gould would differ from the instant claims (response p. 23).

This argument is not found persuasive because Gould was combined with Finer and Rangan 1998 to show that it would have been obvious to try using a sealing material in the regeneration of cotton tissues for transformation to prevent at least contamination of the culture.

Applicants argue that Gould relates to culture of shoot apical meristems and would not be applied by one of skill in the art regarding embryogenic cotton cell culture given the numerous differences between Gould and the other references (response p. 23).

This argument is not found persuasive because as stated above Gould was combined with Finer and Rangan 1998 to show that laboratory film may be used in plant regeneration with success.

Applicants argue that the total references would not give a skilled practitioner any expectation of success and teach away from the claimed method (response p. 23).

This argument is not found persuasive because as stated above a claim would have been obvious if all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in functions and the combination would have yielded nothing more than predictable results. In this instant the method of culturing regenerable transgenic embryogenic cotton tissue under dark lighting condition is known in the art as taught by Finer in view of Rangan 1998. It would have been obvious to combine the teachings of Finer in view of Rangan 1998 with Gould because Gould taught the use of laboratory film in the regeneration of cotton tissue for transformation with success. There is no reason why the use of laboratory film would not work with the teachings of Finer in view of Rangan 1998 and further in view of Gould.

Claims 50-52 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Finer in view of Davis et al, further in view of Chi et al, further in view of Rangan 1993, and further in view of Firoozabady 1987 as applied to claims 37-41, 43 and 44 above, and further in view of Gould.

The teachings of Finer in view of Davis et al, further in view of Chi et al, further in view of Rangan 1993 and further in view of Firoozabady 1987 are discussed above.

Finer in view of Davis et al, further in view of Chi et al, further in view of Rangan 1993 and further in view of Firoozabady 1987 do not teach that the culture is wrapped with sealing material.

The teachings of Gould are discussed above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to culture regenerable non-embryogenic cotton callus tissue containing ascorbic acid and AVG in medium under dark lighting conditions and culturing the embryogenic cotton tissue in medium with filter paper and casein hydrolysate under dark lighting or low light as taught by Finer in view of Davis et al, further in view of Chi et al, further in view of Rangan 1993 and further in view of Firoozabady 1987 and to combine that method with wrapping with sealing material as taught by Gould. One of ordinary skill in the art would have been motivated to do so given that sealing material would reduce contamination in the culture medium. Furthermore, one of ordinary skill in the art would have a reasonable expectation of success in the combination of Finer in view of Davis et al, further in view of Chi et al, further in view of Rangan 1993, further in view of Firoozabady 1987 and further in view of Gould because wrapping with sealing material would be a choice of experimental design and is considered within the purview of the cited prior art. Thus, the invention as a whole was clearly *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

Applicants argue that it is unclear why preventing evaporation would not also be a motivation in view of the Action at page 19 (response p. 24).

This argument is not found persuasive because evaporation is just one reason one of ordinary skill in the art would use a sealing material. Another reason may be to prevent contamination if the Petri dish is dropped accidentally.

Applicants argue that a skilled practitioner would not have any expectation of success in wrapping the culture material because Gould relates to organogenic and the instant claims are to cotton embryogenesis (response p. 24).

This argument is not found persuasive because as stated above the use of sealing material was successful in the regeneration of organogenic culture. Since there was success in wrapping the dish with sealing material, then why would not there be success in wrapping the regenerable non-embryogenic cotton callus tissue?

Conclusion

No claims are allowed.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to June Hwu whose telephone number is (571) 272-0977. The Examiner can normally be reached Monday through Thursday from 6:00 a.m. to 4:30 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Anne Marie Grunberg, can be reached on (571) 272-0975. The fax number for the organization where this application or proceeding is assigned is (571) 273-8300.

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/June Hwu/
Examiner, Art Unit 1661